REMARKS

Upon entry of the present Amendment-E, the pending claims in the application are claims 1-7, 32, 33, 35, and 37-40, of which claims 1 and 5 are independent. Claims 1, 5, 7, and 35 have been amended by the present Amendment-F. New claims 37-40 have been added.

The above-identified Office Action has been reviewed, the objections and rejections carefully considered, and the Examiner's comments carefully weighed. In view thereof, the present Amendment-F is submitted.

It is contended that by the present Amendment-F, all bases of objections and rejections set forth in the Office Action have been traversed and overcome. Accordingly, reconsideration and withdrawal of the objections and rejections is respectfully requested.

Amendments Presented

In the Claims: claim 1 has been amended to overcome two minor informalities noted by the Examiner, and by further specifying that --- the gripping mechanism includes a recess which surrounds outer edges of the pair of fingers of the first or second protrusion such that the fingers cannot move apart in a direction perpendicular to the joining direction ---.

Claim 5 has been amended to overcome an inconsistency with claim 7, as noted by the Examiner, by defining that the friction stir welding process is for joining first and second metal workpiece ends together, and involves bringing a first end face and a second end face respectively on the first and second metal workpiece ends into abutment against each other….

Claim 7 is amended to be consistent with amended claim 5.

Claim 35 has been rearranged to avoid any ambiguity.

New claim 37-40 have been added by the present amendment. New claim 37 defines that the plate material of claim 1 has upper and lower surfaces and the end faces which extend between the upper and lower surfaces in a thickness direction of the plate material; new claim 38

further defines that the gripping mechanism of claim 1 includes another recess which surrounds outer edges of the pair of fingers of the first or second protrusion such that the fingers cannot move apart in a direction perpendicular to the end faces, said recesses being spaced from each other and respectively grip the pairs of fingers of the first and second protrusions during said gripping step; new claim 39 further defines that in the process of claim 5 said first end face and said second end face are on opposite ends of a single workpiece; and new claim 40 further defines that in the process of claim 5 each of the first and second metal workpiece ends includes upper and lower surfaces, and the first and second end faces extend between the upper and lower surfaces in a thickness direction of the workpiece ends, respectively.

Applicant respectfully submits that the above amendments, including new claims, are fully supported by the original disclosure including drawings. For example, the discussion of the gripping mechanism recess (e.g., recess 70 or 72 in the first embodiment of the invention) which surrounds outer edges of the pair of fingers of the first or second protrusion (e.g., protrusion 8 or 9 in the first embodiment) such that the fingers cannot move apart in a direction perpendicular to the joining direction (i.e., perpendicular to the arrow A in Figs. 1, 8) added to claim 1, and the related limitation in new claim 38, is fully supported by the disclosure of the gripping mechanism in the exemplary embodiments of the original application, e.g., in Figs. 6 and 19 and paragraph [0148] and of the published application. Further the language added regarding the upper and lower surfaces joined by end faces of the plate material / workpiece ends is fully supported by the exemplary plate material / workpieces shown in the drawings and described throughout the original disclosure. Applicant also respectfully submits that no new matter is introduced into the application by amending the claims, and by adding new claims, since the entire subject matter thereof was expressly or inherently disclosed in the original claims, specification and the drawings.

Claim Objections and Rejections – 35 USC §112, Second Paragraph

1. In the Office Action (page 2, item 3), the Examiner objects to the term "end" at line 10 of claim 1, and suggests that it should be ---ends---.

2. In the Office Action (page 2, item 4), the Examiner rejects claim 7 as indefinite because it requires the end faces to be on different workpieces, whereas independent claim 5 defines the end pieces as being of the same workpiece. The Examiner also indicates that for purposes of examination she interprets claim 7 consistent with claim 5, i.e., the end faces are on the same workpiece.

3. in the Office Action (page 2, item 5), the Examiner rejects claim 1 as indefinite because there is insufficient antecedent basis for the language "said first and second protrusions" in line 17.

Applicant's Response:

Upon careful consideration and in light of the above amendments to claims 1, 5, 7, which adopt suggestions of the Examiner, applicant respectfully submits the objection and rejections are overcome. The claim language as amended would be clearly understood by persons of ordinary skill in the art, especially when considered in light of the corresponding discussion in the specification, and it is respectfully requested that the objection and rejections be reconsidered and withdrawn.

Claim Rejections – 35 USC §103

At pages 2-11 of the Office Action, the Examiner as presented several rejections encompassing all claims (1-9 and 32-36) under 35 USC 103(a) as being unpatentable over various combinations of references, which are the same references as applied in the Office Action of 24 July 2009. Particularly:

1. Claims 1, 2, 35 are rejected as being obvious / unpatentable over Colligan et al. (US 5,794,835) (hereinafter "Colligan") in view of Urschel (US 2,148,714) (hereinafter "Urschel") and Knauth et al. (US 2,740,877) (hereinafter "Knauth");

2,. Claim 3 is rejected as being obvious / unpatentable over Colligan in view of Urschel and Knauth as applied to claim 1 and further in view of Cleveland et al. (US 2002/0020164 (herein after "Cleveland");

3. Claim 4 is rejected as being obvious / unpatentable over Colligan in view of Urschel and Knauth as applied to claim 1 and further in view of Lawrence (WO 99/33594) (herein after "Lawrence");

4. Claim 32 rejected as being obvious / unpatentable over Colligan in view of Urschel and Knauth as applied to claim 1 and further in view of Boon et al. (US 6,325,273) (hereinafter "Boon");

5. Claims 8, 9, 34 rejected as being obvious / unpatentable over Urschel in view of Colligan;

6. Claim 36 rejected as being obvious / unpatentable over Urschel in view of Colligan as applied to claim 8 and further in view of Knauth; and

7. Claims 5-7 and 33 rejected as being obvious / unpatentable over Colligan in view of Urschel and Boon.

The Examiner rejections are mostly repeated from the previous Office Action, and applicant does not here repeat all of the Examiner's various positions. However, the Examiner does provide some new explanations / qualifications in her rejections in the "Response to Arguments" at item 9 on pages 11-13 of the Office Action, which are briefly summarized below.

Relative to the rejection based on Colligan, Urschel, and Knauth, for example, the Examiner asserts that: Colligan teaches that the welded abutting region between end faces of the

plate material is devoid of a formation of swelling according to his c.4, lines 57-60; the Examiner is selectively incorporating only the gripping mechanism of Knauth; including the term "only" does not exclude other functions that may be performed by the gripping mechanism or gripping the protrusions by other elements of the apparatus; Colligan's friction stir welding (fsw) operation results in "said abutting region being devoid of a formation of swellings (column 4, lines 57-60)"; etc.

Relative to applicant's arguments that Boon does not teach a probe with a substantially circular cross section, is not forming a butt joint, and wherein the probe is not displaced from the boundary line between the abutted end faces, the Examiner (*inconsistently*) assets that: Boons probe is substantially circular when you consider all of the protrusions collectively, whereas the probe is displaced from the boundary line when you consider only one of the protrusions; and the Examiner is selectively importing only Boon's probe not his entire method. Also, the Examiner (favorably) indicates that she appreciates that the intention of the invention is to form butt welds (contrary to the lap joints of Boon), and she suggests a definition of "end faces" to avoid her broad interpretation.

Relative to applicant's argument that Knauth's gripping mechanism is contrary to Colligan's method (and to the claimed invention), the Examiner asserts that Knauth discusses use of his method for welding a pipe seam at his c.6, lines 14-18, and is capable of / used for seam welding pipes like the present invention.

Relative to applicant's argument that Knauth's gripping mechanism grips edges and not protrusions as claimed, the Examiner asserts that she is selectively importing only the gripping mechanism of Knauth, and these are capable of gripping Colligan's protrusions.

Relative to applicant's argument that the Examiner misinterprets claim 2, the Examiner asserts that she is not misinterpreting, but her rejection reflects that the cylinder must be held in

some way during the welding process to assure it is positionally correct.

Applicant's Response:

Upon careful consideration and in light of the above amendments to claims 1, 5, and 35, applicant respectfully traverses each of such rejections and submits that each of present claims 1-7, 32, 33, and 35 patentably distinguish over the applied references (whether the references are considered singly or in combination) for reasons substantially corresponding to those set forth in prior Amendments, e.g., the Examiner's various proposed modifications to the primary references (Colligan or Urschel) based on select teachings of the secondary references are improper under 35 USC 103 because the proposed modifications are based on impermissible hindsight gained exclusively from applicant's disclosure, and not from any motivation which can be fairly gleaned from the references themselves or from any other appropriate source under 35 USC 103; the Examiner's interpretations of the terms of the present claims as reading on various components of the applied references are *unreasonably broad* given the plain meanings of the terms and the meanings of the terms as used in the present application; and the references (collectively) fail to disclose or suggest features of the claimed invention, such that any hypothetical combination based on the actual teachings of the applied references would fail to achieve or make obvious the claimed invention.

Without repeating all of the prior arguments, applicant here addresses the Examiner's rejections of claims 1-7, 32, 33, and 35 in light of the Examiner's "response to Arguments". Given that claims 8, 9, 32, and 34 have been canceled by the present Amendment, the rejections of these claims are moot.

a. Regarding the Examiner's statement that Colligan's fsw operation results in "said abutting region being devoid of a formation of swellings (column 4, lines 57-60)", such statement is contradicted by Colligan's actual disclosure because the primary focus of

Colligan's invention is his cutting tool attached to the fsw tool such that the cutting tool can "machine excess weld material away." In other words, Colligan's fsw operation results in formation of swellings at the fsw joint, but he removes the excess / swollen material using his unique cutting tool attachment.

b. Relative the proposed modifications of Colligan relative to select features of Urschel, and vice versa, such proposed modifications would never be considered obvious or desirable by persons of ordinary skill in the art given the *significant and incompatible differences* between a fsw method as taught by Colligan and an older, conventional welding method involving use of a welding material for joining workpieces together as taught by Urschel. For example, the relatively large, V-shaped recess 48 as taught by Urschel has a welding material disposed therein during the welding operation, and the welding material is fixed within the recess to fill up the recess by the welding operation. Such a recess is not required and is undesirable in a fsw operation, noting that the fsw does not involve use of an auxiliary welding material, whereas the recess would likely remain at least partially open after the welding operation, resulting in a weakened joint and a poor appearance. Further, a flange part 8 as disclosed by Urschel necessarily extends along / reinforces the full length of the workpiece, and is relatively large / bulky (it projects inwardly a distance at least as large as the sheet metal thickness). Such reinforcement is not required in a fsw joint as formed by Colligan, and would *directly interfere* with an FSW probe 4 and/or associated members 5, 6 of Colligan, preventing the probe from smoothly / properly joining the abutting faces.

Applicant respectfully submits that the Examiner's rejection, whereby she selectively "imports" only specific features of the secondary references, is unrealistic and improper under 35 USC 103 because it ignores the incompatible differences in the relevant components of the two references, and thus distorts what the reference would fairly teach the person or ordinary skill in

the art. Based on actual disclosures of the references, such persons would not consider the proposed modifications to be obvious or desirable because they directly violate / destroy the underlying patented inventions based on the disclosures of Colligan and Urschel, applicant has amended independent claim 1 above to further define over the references for the purpose of expediting prosecution of the application.

c. Similarly regarding the proposed modifications of Colligan relative to select features of Knauth, such proposed modifications would never be considered obvious or desirable by persons of ordinary skill in the art given the significant and incompatible differences between a fsw method as taught by Colligan and an older, conventional welding method involving use of an electrode, welding wire, flux, etc. in addition to the workpiece being joined together as taught by Knauth. For example, Knauth's gripping mechanism functions together with the horizontal horn assembly 14 and the electrode 21, and the horn assembly 14 would directly interfere with Colligan's lower member 6. Also, Colligan expressly indicates at his col. 4, lines 7-10 that the workpieces are "normally not urged towards each other(emphasis added)" during the FSW welding operation, because this would detrimentally affect such welding process. This is directly contrary to Knauth's method in which "the pieces are urged into close abutting contact during the clamping operation (emphasis added)" as discussed at the sentence bridging his cols. 1-2. The Examiner's rejection, whereby she selectively "imports" only gripping mechanism of Knauth is (again) unrealistic and improper because it ignores the incompatible differences between the structures and functions required by the two references, and thus distorts what the reference would fairly teach the person or ordinary skill in the art.

d. Regarding the Examiner's Response that the gripping mechanism of Knauth is "capable of" gripping Colligan's protrusions, applicant respectfully traverses such Response because the mere possibility that a component of a reference may be "capable of" performing a function is

not an appropriate standard under 35 USC 103. Rather, according to the Courts, the Examiner must articulate appropriate reasoning as to why the person of ordinary skill in the art would have been motivated to make a given modification to the primary reference based on teachings of secondary reference(s), common sense, etc. Here, Knauth's specifically discloses that his gripping mechanism grips each of the workpieces fully along the joint line being welded. This is contrary to proposed modification to Colligan wherein Knauth's gripping mechanism is to be hypothetically applied for gripping Colligan's run-off tabs which are formed only at the ends of workpieces, and which are not welded or only partially welded. It is respectfully submitted that the Examiner has not articulated an appropriate reasoning under 35 USC 103 for applying Knauth's gripping mechanism to Colligan's run-off tabs.

Additionally, applicant submits that Knauth does not disclose or suggest a welding operation wherein a "gripping step involves gripping only said protrusions by said gripping mechanism" as now defined in claim 35. Again the gripping mechanism of Knauth is designed constructed to grip workpieces fully along a welded joint, contrary to the claimed feature.

Although it is applicant's position that the Examiner has not established prima facie obvious ness of any of the present claims under 35 USC 103 based on the proposed combinations of select features of the Colligan, Urschel, and Knauth references, applicant has amended claim 1 above to further distinguish over these references for the purpose of expediting prosecution of the application.

Particularly, claim 1 now defines that "… the gripping mechanism includes a recess which surrounds outer edges of the pair of fingers of the first or second protrusion such that the fingers cannot move apart in a direction perpendicular to the joining direction". Thus, according to the present claim 1 the pair of fingers forming the first or second protrusion (projecting from corners of the plate material along the joining direction at opposite ends of the hollow cylindrical

tube) are jointly gripped in a direction perpendicular to the joining direction, or in other words perpendicular to the end faces of the plate material. This is contrary to the gripping action performed by Knauth's gripping mechanism, which functions to individually grip workpieces (metal sheets) by applying forces in a vertical direction. In Knauth, a workpiece is gripped between an elevator base elevating upward and a plate positionally fixed above the elevator base.

The above distinction is significant. If the fingers of the present invention (and similarly Colligan's run-off tabs) were gripped in a vertical direction as in Knauth's gripping mechanism, the fingers would be covered by the gripping mechanism, making it difficult / impossible to embed the fsw probe in the fingers. The gripping mechanism of the present invention, which jointly gripping the fingers of a protrusion using the recess as now claimed, is not only much simpler in structure than Knauth's gripping mechanism, but also avoids any interference with the fsw probe.

e. Regarding the Examiner's Response rebuttal involving the Boon reference and the rejection of claims 5-7 and 33, applicant respectfully traverses such comments because they are *directly inconsistent with each other*, and because the rebuttal is based on *unreasonably broad* interpretations of claim terms which are inconsistent with the plain meaning of the terms and with by the meaning of the terms used in the present disclosure.

For example, the Examiner inconsistently asserts (on the one hand) that Boon's probe meets the claimed "circular cross section" by collectively considering all of the protrusions of the probe, and asserts (on the other hand) that Boon's probe meets the claimed displacement from the boundary line along which the end faces are joined by considering less than all of the protrusions of the probe. Such inconsistent positions regarding interpretation of Boon's probe are improper because the relevant features are both set forth in independent claim 5 and have a cooperative direct bearing on the advantageous functioning of the fsw process according to the

present invention to achieve a more uniform, high quality joint having no unjoined region, which is explained in conjunction with Figs. 11-13. Boon's multi-protrusion probe does not have a central region thereof displaced from any boundary line between end faces being joined together in a fsw operation.

Relatedly, applicant respectfully submits that the opposing pair of probe tips in the whisk style probes shown in Boon's drawings are not "substantially circular", nor is Boon's rotating probe "displaced" relative to the joint line according to the plain meaning of these terms or according to the meaning used in the present specification.

As is clear from the disclosure and Fig. 1 of Boon, he does not teach friction-stir-welding of two end faces. Rather, Boon friction-stir-welds two overlapping faces of laminated workpieces, and at his col. 4, lines 47-49 he describes that a pair of lead sheets 5, 6 are overlaid one on another in order to form a lap joint. Again, applicant acknowledges the Examiner's concession at the paragraph bridging pages 11-12 of the Office Action regarding a joint as formed by the present invention and a lap joint of Boon.

Further, although Boon discloses, at the sentence bridging his cols. 2-3, that his fsw probe is displaced by 1-5° from the plane perpendicularly to the workpieces, what he specifically indicates, e.g., in his Fig. 1, is that the probe is tilted rearward with respect to the direction of movement of the fsw machine during the welding operation. That is, Boon does not teach or suggest displacement of the probe center from the boundary of abutted end faces of the workpieces. In fact, the probe extends fully through the upper workpiece and into the lower workpiece regardless of the minor inclination of the probe.

As would be understood by persons of ordinary skill in the art, Boon's fsw method / apparatus for forming lap joints does not address or overcome the problem of unjoined regions caused by the different amount of melted material flowing on the advancing and retreating sides of

the fsw probe when joining abutting workpiece end faces such as discussed in relation to Figs. 11-13 of the present application. Thus, even if the select features of Boon are hypothetically combined with Colligan and Urschel in the manner proposed by the Examiner, any resulting combination based on the actual teachings of these references would fail to achieve or make obvious the fsw process of claims 5-7 and 33, e.g., none of the references teaches or suggests friction stir welding tool having a probe with a substantially circular cross section on a tip end thereof, wherein … said probe is plunged with a central region thereof being displaced from said boundary line to said second end by a predetermined distance within a range equal to or smaller than the radius of the probe; … a rotational axis of said probe extends substantially parallel to a plane between said first and second end faces where said faces are brought into abutment with each other…."

For all of the foregoing reasons, applicant respectfully requests reconsideration and withdrawal of the rejection of claims 5-7 32, 33, and 35under 35 USC §103(a).

Other Matters

New claims 37-40 are believed to patentably distinct over the references of record for the reasons provided in relation to claims 1 and 5 hereinabove, and based on the merit of the additional features recited in the new claims.

Conclusion

In conclusion, based on all of the foregoing, applicant respectfully submits that all of the objections and rejections set forth in the Office Action are overcome, and that as presently amended, all of the pending claims are believed to be allowable over all of the references of record, whether considered singly or in combination.

Applicant requests reconsideration and withdrawal of the rejection of record, and allowance of the pending claims.

If the Examiner is not fully convinced of the allowability of all of the claims now in the

application, applicant respectfully requests that the Examiner telephonically contact applicant's undersigned representative to expeditiously resolve prosecution of the application.

Favorable reconsideration is respectfully requested.

Respectfully submitted,

/_____/

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